National Transportation Safety Board
Aviation Accident Final Report

Location:	SEEKONK, MA	**Accident Number:**	BFO94FA008
Date & Time:	11/14/1993, 0026 EST	**Registration:**	N4224H
Aircraft:	MOONEY MO-20J	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General Aviation - Business		

Analysis

DURING A FOUR HOUR IFR CROSS COUNTRY FLIGHT, IN CRUISE, THE ENGINE'S DRY AIR VACUUM PUMP FAILED. THE PILOT ELECTED TO CONTINUE TO HIS FINAL DESTINATION, ABOUT 180 MILES AWAY, NAVIGATING BY HIS LORAN. THE PILOT WAS NOTIFIED BY AIR TRAFFIC CONTROL PERSONNEL THAT IN ORDER TO CONTINUE TO HIS DESTINATION, IMC COULD NOT BE AVOIDED. THE PILOT STATED THAT IMC WAS NOT A PROBLEM AND HE CONTINUED THE FLIGHT. DURING A NO GYRO VECTOR APPROACH TO THE LOCALIZER IN IMC, AT AN ALTITUDE OF ABOUT 1,900 FEET MSL, THE PILOT BECAME SPATIALLY DISORIENTED AND LOST CONTROL OF THE AIRPLANE. THE AIRPLANE IMPACTED THE TERRAIN AND THE PILOT AND PASSENGER WERE FATALLY INJURED. THE DRY AIR VACUUM PUMP WAS EXAMINED. THE EXAMINATION REVEALED THAT THE INPUT SHAFT OF THE PUMP WAS FACTURED PRIOR TO IMPACT.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: THE PILOT'S INADEQUATE IN FLIGHT PLANNING/DECISION TO CONTINUE FLIGHT INTO KNOWN ADVERSE WEATHER CONDITIONS AFTER THE ENGINE'S DRY AIR VACUUM PUMP FAILED AND THE PILOT'S FAILURE TO MAINTAIN AIRPLANE CONTROL DURING APPROACH. A FACTOR IN THE ACCIDENT WAS THE DRY AIR VACUUM PUMP FAILURE.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: CRUISE

Findings
1. (F) VACUUM SYSTEM - FAILURE,TOTAL

Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: APPROACH

Findings
2. (C) IN-FLIGHT PLANNING/DECISION - INADEQUATE - PILOT IN COMMAND
3. NOT PERFORMED - PILOT IN COMMAND
4. WEATHER CONDITION - LOW CEILING
5. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND
6. SPATIAL DISORIENTATION - PILOT IN COMMAND

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Factual Information

HISTORY OF FLIGHT

On Sunday, November 14, 1993, at 0026 eastern standard time, a Mooney MO-20J, N4224H, owned, and operated by the pilot, collided with terrain in Seekonk, Massachusetts, about 10.5 nautical miles northeast of the Theodore Francis Green State Airport located in Providence, Rhode Island. The pilot and sole passenger were fatally injured. The airplane was destroyed. Visual meteorological conditions prevailed at the time of the accident and an Instrument Flight Rules (IFR) flight plan was filed for the flight. The cross country flight originated from Pontiac, Michigan, about 2058, and was destined for Providence, Rhode Island. The business trip was conducted under 14 CFR Part 91.

According to the Lansing, Michigan, Flight Service Station (FSS) records, the pilot filed an IFR flight plan that specified a cruising altitude of 10,000 feet mean sea level. Air traffic control tapes revealed that shortly after takeoff, N4224H was cleared to, and had climbed to 10,000 feet. N4224H remained at 10,000 feet until 2315, when the pilot requested, and was cleared to descend to 7,000 feet.

According to the Boston Air Route Traffic Control Center (ARTCC) records, about one hour and forty five minutes after N4224H departed Pontiac, and about 180 statue miles from Providence, the New York ARTCC advised Boston ARTCC to have N4224H check his flight instruments because it appeared that N4224H was "...going the wrong way." At 2250, the Boston ARTCC queried the pilot about the airplane's heading and the pilot responded, "Two four hotel has lost its vacuum system."

As the flight progressed, the controller notified the pilot that if he continued the flight to his destination, instrument meteorological conditions could not be avoided. The pilot stated that he was using the airplane's long range navigation (LORAN) equipment to navigate and was going to continue the flight to Providence.

At 2301:15, the controller notified the pilot that he observed the airplane on radar making "...noticeable turns at least 30 degrees or so..." and offered his assistance. The pilot declined the controllers assistance and continued the flight to Providence.

At 2349, the pilot requested, and was cleared to descend to 5,000 feet by a Providence Approach controller. At 2359, N4224H was passed off to a Boston ARTCC controller who provided vectors to the localizer for the ILS approach to runway 23L at the Providence-Theodore Francis Green State Airport. Prior to being passed off to the Boston ARTCC controller, the pilot stated to the Providence Approach controller that he had "...information Lima." Information Lima contained current weather for the Providence area and reported the cloud ceiling to be overcast and measured at 1,400 feet mean sea level.

The Boston ARTCC controller asked the pilot, "Mooney two four hotel would you prefer ah no gyro ah vectors?" The pilot responded, "Two four hotel ah yeah affirmative." The controller gave N4224H two no gyro vector approaches to the localizer. N4224H was cleared to and descended to 2,100 feet. During the first approach, the controller lost radar contact with N4224H, and radio communications from the pilot were relayed to the controller via another airplane in the area. Because the localizer was not captured, the pilot executed a missed approach.

During the second attempt of no gyro vectors to the localizer, the pilot transmitted, "...we're following the localizer we got no problem." At 0521:44, the controller cleared N4224H for the ILS runway 23L approach. At 0021:55, the pilot stated, "Two four hotel you just talked to me and we just lost it." This was the last transmission received from the pilot. At 0023:44, radar contact was lost with N4224H at an altitude of 1,900 feet.

The accident occurred during the hours of darkness at 41 degrees 43 minutes and 30 seconds north latitude and 71 degrees 25 minutes and 40 seconds west longitude.

PILOT INFORMATION

The pilot held a private pilot certificate with single engine land and instrument airplane ratings. According to the pilot's log book and this investigator's approximation, at the time of the accident, the pilot had accrued about 1,686 total flight hours, of which 58 hours were actual instrument time and 175 hours were flown at night. The pilot's log book indicated he met the instrument currency requirements as detailed in 14 CFR Part 61.57(e). The currency of the pilot's biennial flight review could not be determined. In the past 147 days, the pilot had flown the accident airplane about 120 hours.

AIRPLANE INFORMATION

At the time of the accident, according to the airplane's maintenance log books, N4224H had accumulated about 3,005 total hours of flight time. It received an annual inspection on January 1, 1993, at 2,865.6 hours. The dry air vacuum pump was last replaced on January 2, 1991, at a total airplane flight time of 2,433.1 hours. A label on the outer surface of the dry air vacuum pump recommended replacement of the pump "...every 700 service hours or 3 years...," which ever came first.

METEOROLOGICAL CONDITIONS

According to the Lansing, Michigan, Flight Service Station recordings, the pilot of N4224H called the station at 2002 and received a full weather briefing for the intended route of flight. During the weather briefing, the FSS briefer stated, "...along that route of flight I see marginal VFR basically...." (See attached Flight Service Station transcription for entire briefing.)

At 0027, the National Weather Service at Providence, Rhode Island, issued the following observation:

Ceiling--measured 1,400 overcast; visibility--10 miles; temperature--56 degrees fahrenheit; dew point--52 degrees fahrenheit; wind--210 degrees at 12 knots; altimeter--30.10 inches of mercury.

AIDS TO NAVIGATION

Federal Aviation Administration personnel performed a ground check of the Instrument Landing System (ILS) for runway 23L at the Theodore Francis Green State Airport a few hours after the accident. No anomalies in the system were noted during the check. Further, on November 15, 1993, one day after the accident, FAA personnel performed a flight check of the ILS 23L Approach. No system anomalies were noted during the flight check.

WRECKAGE AND IMPACT INFORMATION

The airplane wreckage and accident site were examined on November 14, 1993. Examination of the accident site revealed the airplane crashed in heavily wooded terrain. The initial impact

point was a large 66-foot-tall tree. Other small trees were damaged with cuts and broken limbs. A large crater containing pieces of the airplane and engine was located about 80 feet southwest of the large tree. A long thin mark in the ground, about 12 feet long, extended from the left side of the ground scar.

The airplane wreckage was strewn along a magnetic heading of 230 degrees for about 120 feet. Portions of the airplane and engine were burned. The fuselage, cabin area, and cockpit were destroyed. The tail section, including the rudder and elevator, came to rest against a tree about 100 feet from the crater and was burned. Control surface positions and control continuity were not determined. The landing gear were destroyed and their position was not determined.

The engine was found just outside the crater and the propeller blades were separated from the hub and found buried in the crater. The propeller blade tips were curled and broken.

The engine driven dry air vacuum pump, directional gyro, and attitude indicator were removed from the wreckage and sent to the Safety Board's laboratory for examination. The vacuum regulator filter and central filter were not located. (See TEST AND RESEARCH section of this report for examination results.)

MEDICAL AND PATHOLOGICAL INFORMATION

The autopsy was performed on November 15, 1993, by Dr. James Weiner at the Medical Examiner's Office for the Barnstable County Southeastern Region located in Pocasset, Massachusetts. The autopsy revealed no evidence of physical incapacitation or impairment.

The toxicology was performed by Daniel M. Pratt for the Commonwealth of Massachusetts Department of State Police Crime Laboratory, 1010 Commonwealth Avenue, Boston, Massachusetts. Negative results were reported for all screened drugs and volatiles.

TEST AND RESEARCH

The dry air vacuum pump, attitude indicator, and directional gyro were examined at the Safety Board's Laboratory on February 1, 1994.

The examination of the vacuum pump revealed that the input shaft was fractured. The metallurgist's factual report stated that examination of the fracture surface revealed "...The final fracture area was centered on the shaft diameter indicating purely torsional loading of the shaft. The orientations and directions of the dimples were consistent with the direction of the normal torsional drive loads fracturing the shaft as if the engine side of the shaft continued to turn relative to the stationary half of the shaft on the pump side." Further the report states, "Examination of the outboard rotor sealing plate (shown in figure 2) revealed an impression from forceful contact with the rotor. The impression outlined the edge of the rotor including two of the vane slots clearly showed that the rotor was stationary relative to the end cap when the impression was formed."

Examination of the attitude indicator and directional gyro's rotor housing cases revealed contact marks on their respective housing case. The contact marks showed no evidence of rotational motion.

The recorded radar data, provided by the Federal Aviation Administration, depicted a ground track for the airplane for the last few minutes of the flight. The airplane was flying on a westerly heading at a ground speed of about 100 knots, followed by a turn to the south with a turn radius of 0.25 nautical miles.

The ground speed increased to over 150 knots and the turn radius increased to 0.45 nautical. During the first portion of the turn, the airplane's bank angle was calculated to be about 30 degrees. During the acceleration, to achieve 150 knots and a turn radius of 0.45 nautical miles, the airplane's bank angle would have had to have been at least 36 degrees. (See attached Recorded Radar Study for more details.)

ADDITIONAL INFORMATION

The airplane wreckage was released to the deceased pilot's estate representative, Mr. Jim Hosenfus, located at 11911 Weddington Street, North Hollywood, California, on May 23, 1994.

Pilot Information

Certificate:	Private	**Age:**	47, Male
Airplane Rating(s):	Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane Single-engine; None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	05/11/1993
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:	1686 hours (Total, all aircraft), 101 hours (Total, this make and model), 1595 hours (Pilot In Command, all aircraft), 60 hours (Last 90 days, all aircraft), 25 hours (Last 30 days, all aircraft), 6 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	MOONEY	**Registration:**	N4224H
Model/Series:	MO-20J MO-20J	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	24-0669
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	01/01/1993, Annual	**Certified Max Gross Wt.:**	2740 lbs
Time Since Last Inspection:	41 Hours	**Engines:**	1 Reciprocating
Airframe Total Time:	3005 Hours	**Engine Manufacturer:**	LYCOMING
ELT:	Installed, not activated	**Engine Model/Series:**	IO-360-A3B6D
Registered Owner:	SHERMAN, LEE ALLEN	**Rated Power:**	200 hp
Operator:	SHERMAN, LEE ALLEN	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Night/Dark
Observation Facility, Elevation:	PVD, 55 ft msl	**Distance from Accident Site:**	11 Nautical Miles
Observation Time:	0027 EST	**Direction from Accident Site:**	240°
Lowest Cloud Condition:	Unknown / 0 ft agl	**Visibility**	10 Miles
Lowest Ceiling:	Overcast / 1400 ft agl	**Visibility (RVR):**	0 ft
Wind Speed/Gusts:	12 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	210°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	13°C / 11°C
Precipitation and Obscuration:			
Departure Point:	OAKLAND PONTIAC, MI (PTK)	**Type of Flight Plan Filed:**	IFR
Destination:	PROVIDENCE, RI (PVD)	**Type of Clearance:**	IFR
Departure Time:	2058 EST	**Type of Airspace:**	Class E

Airport Information

Airport:	THEODORE FRANCIS GREEN ST (PVD)	**Runway Surface Type:**	Asphalt
Airport Elevation:	55 ft	**Runway Surface Condition:**	Wet
Runway Used:	23L	**IFR Approach:**	Localizer Only
Runway Length/Width:	7166 ft / 200 ft	**VFR Approach/Landing:**	

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	On-Ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	MARGARET B NAPOLITAN	**Report Date:**	10/20/1994
Additional Participating Persons:	JIM VOLNER; BEDFORD, MA		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		